Summary of Factors Affecting the Polar Bear

Section 4 of the Act (16 U.S.C. 1533), and implementing regulations at 50 CFR part 424, set forth procedures for adding species to the Federal Lists of Endangered and Threatened Wildlife and Plants. Under section 4(a) of the Act, we may list a species on the basis of any of five factors, as follows: (A) The present or threatened destruction, modification, or curtailment of its habitat or range; (B) overutilization for commercial, recreational, scientific, or educational purposes; (C) disease or predation; (D) the inadequacy of existing regulatory mechanisms; or (E) other natural or manmade factors affecting its continued existence. In making this finding, the best scientific and commercial information available regarding the status and trends of the polar bear is considered in relation to the five factors provided in section 4(a)(1) of the Act.

In the context of the Act, the term ''endangered species'' means any species or subspecies or, for vertebrates, Distinct Population Segment (DPS), that is in danger of extinction throughout all or a significant portion of its range, and a ''threatened species'' is any species that is likely to become an endangered species within the foreseeable future. The Act does not define the term ''foreseeable future.'' For this final rule, we have identified 45 years as the foreseeable future for polar bears; our rationale for selecting this timeframe is presented in the following section.

Foreseeable Future

For this final rule, we have determined the ''foreseeable future'' in terms of the timeframe over which the best available scientific data allow us to reliably assess the effects of threats on the polar bear.

The principal threat to polar bears is the loss of their primary habitat-sea ice. The linkage between habitat loss and corresponding effects on polar bear populations was hypothesized in the past (Budyko 1966, p. 20; Lentfer 1972, p. 169; Tynan and DeMaster 1997, p. 315; Stirling and Derocher 1993, pp. 241–244; Derocher et al. 2004, p. 163), but is now becoming well established through long-term field studies that span multiple generations (Stirling et al. 1999, pp. 300–302; Stirling and Parkinson 2006, pp. 266–274; Regehr et al. 2006; Regehr et al. 2007a, 2007b; Rode et al. 2007, pp. 5–8; Hunter et al. 2007, pp. 8–14; Amstrup et al. 2007).

The timeframe over which the best available scientific data allows us to reliably assess the effect of threats on the species is the critical component for determining the foreseeable future. In the case of the polar bear, the key threat is loss of sea ice, the species' primary habitat. Sea ice is rapidly diminishing throughout the Arctic, and the best available evidence is that Arctic sea ice will continue to be affected by climate change. Recent comprehensive syntheses of climate change information (e.g., IPCC AR4) and additional modeling studies (e.g., Overland and Wang 2007a, pp. 1–7; Stroeve et al. 2007, pp. 1–5) show that, in general, the climate models that best simulate Arctic conditions all project significant losses of sea ice over the 21st century. A key issue in determining what timeframe to use for the foreseeable future has to do with the uncertainty associated with climate model projections at various points in the future. Virtually all of the climate model projections in the AR4 and other studies extend to the end of the 21st century, so we considered whether a longer timeframe for the foreseeable future was appropriate. The AR4 and other studies help clarify the scientific uncertainty associated with climate change projections, and allow us to make a more objective decision related to the timeframe over which we can reliably assess threats.

Available information indicates that climate change projections over the next 40–50 years are more reliable than projections over the next 80–90 years. This is illustrated in Figure 5 above. Examination of the trend lines for temperature using the three emissions scenarios, as shown in Figure 5, illustrates that temperature increases over the next 40–50 years are relatively insensitive to the SRES emissions scenario used to model the projected change (i.e., the lines in Figure 5 are very close to one another for the first 40–50 years). The ''limited sensitivity'' of the results is because the state-of-the-art climate models used in the AR4 have known physics connecting increases in GHGs to temperature increases through radiation processes (Overland and Wang 2007a, pp. 1–7, cited in J. Overland, NOAA, in litt. to the Service, 2007), and the GHG levels used in the SRES emissions scenarios follow similar trends until around 2040–2050. Because increases in GHGs have lag effects on climate and projections of GHG emissions can be extrapolated with greater confidence over the next few decades, model results projecting out for the next 40–50 years (near-term climate change estimates) have greater credibility than results projected much further into the future (long-term climate change) (J. Overland, NOAA, in litt. to the Service, 2007). Thus, the uncertainty associated with emissions is relatively smaller for the 45-year ''foreseeable future'' for the polar bear listing. After 2050, greater uncertainty associated with various climate mechanisms, including the carbon cycle, is reflected in the increasingly larger confidence intervals around temperature trend lines for each of the SRES emissions scenarios (see Figure 5). In addition, beyond 40–50 years, the trend lines diverge from one another due to differences among the SRES emissions scenarios. These SRES scenarios diverge because each makes different assumptions about the effects that population growth, potential technological improvements, societal and regulatory changes, and economic growth have on GHG emissions, and those differences are more pronounced after 2050. The divergence in the lines beyond 2050 is another source of uncertainty in that there is less confidence in what changes might take place to affect GHG emissions beyond 40–50 years from now.

The IPCC AR4 reaches a similar conclusion about the reliability of projection results over the short term (40–50 years) versus results over the long term (80–90 years) (IPCC 2007, p. 749) in discussing projected changes in surface air temperatures (SATs):

> ''There is close agreement of globally averaged SAT multi-model mean warming for the early 21st century for concentrations derived from the three non-mitigated IPCC Special Report on Emission Scenarios (SRES: B1, A1B and A2) scenarios (including only anthropogenic forcing) run by the AOGCMs * * * this warming rate is affected little by different scenario assumptions or different model sensitivities, and is consistent with that observed for the past few decades * * *. Possible future variations in natural forcings (e.g., a large volcanic eruption) could change those values somewhat, but about half of the early 21st-century warming is committed in the sense that it would occur even if atmospheric concentrations were held fixed at year 2000 values. By mid-century (2046–2065), the choice of scenario becomes more important for the magnitude of multi-model globally averaged SAT warming * * *. About a third of that warming is projected to be due to climate change that is already committed. By late century (2090–2099), differences between scenarios are large, and only about 20% of that warming arises from climate change that is already committed.''

On the basis of our analysis, reinforced by conclusions of the IPCC AR4, we have determined that climate changes projected within the next 40–50 years are more reliable than projections for the second half of the 21st century.

The 40–50 year timeframe for a reliable projection of threats to habitat corresponds closely to the timeframe of